

KITUI SAND DAMS

INTRODUCTION

Most communities in the Arid and Semi-Arid (ASAL) or Sahelian parts of Africa have suffered development since many development activities are not planned to address key issues of technology appropriateness, affordability and sustainability. Usually gender and poverty are not addressed. Often knowledge and expertise are borrowed from wetter parts of the continent or outside. Development of these areas has to be within the context of sustainable ecological resource use. This demands that communities participate in the design and implementation of activities. Technologies and techniques have to increase production for the exploding populations.

KITUI DISTRICT BACKGROUND

Location

Kitui district is one of the twelve districts in Eastern Province of Kenya. It covers an area of 20,402 km² (CBS, 2001). Its altitude ranges from 400 to 1800 meters above sea level. The district borders Machakos and Makueni Districts to the west, Mwingi District to the North, Tana River District to the East and Taita Taveta Districts to the South. It is located between latitude 0 degree 37 inches and 3 degree 0 inches south and longitudes 37 degrees 45 inches and 39 degrees 0 inches east.

Population

The district consists of ten divisions. The total population is 515,422. In an unpublished paper, "Kitui Demographic Time Bomb" Leonard Kisovi writes: "Kitui District is one of the Arid and Semi-Arid regions of Kenya with a worsening population resource balance. Its rapidly deteriorating population-resource balance is a product of limited resource base and an explosive demographic growth rate." ((1990, p. 1). It is estimated that 60% of the households are female headed. (SASOL Socio and Economic Impacts, 2002).

Rainfall

Kitui district is classified as semi-arid with rains being erratic in the larger part of the district especially towards the south. Rainfall is bimodal in nature with short rains occurring between October and December and long rains between March and May.

The rainfall totals range between 250 mm to 750 mm per year. The hill masses, which constitute only 30 percent of the district, receive more rainfall

while on the low lands, which constitute 70 percent of the district, rainfall totals range from 250 mm to 500 mm. The rainfall received in Kitui is unreliable both in amount and distribution. Dry spells are common within the rainy seasons. Due to this, crop failure is a common occurrence. There is a prolonged dry period, from June to October, during which most of the vegetation dries up. There are high temperatures that result to very high evaporation rates of water from the few available sources. The open pan evaporation is estimated at above 2000 mm per year.

Water Sources

River and ground water resources are scarce. River Athi, which forms the southern boundary of the district, is the only permanent river. The river is highly polluted with sewage and industrial wastes from the city of Nairobi. River Tiva however carries water for a long time after rains but in prolonged drought it dries off. This river is polluted by the wastewater from the district capital.

The main sources of water for the bulk of the Kitui people are scoop holes in the ephemeral rivers. A few springs provide water in the areas proximate to the hills. Small earth dams provide some water during the rainy seasons. Most of the boreholes constructed are non-functional. In any case many are dry while others have saline water, which is unsuitable for human, livestock, and irrigation uses. Piped schemes from springs have also fallen to disuse. A few homes have shallow wells, which typically dry up during the dry periods of the year. The salinity problem for all water sources is very severe in the southern part of the district.

SASOL FOUNDATION

Sahelian Solutions Foundation was created by founder seven members with more than one hundred and fifty years of experience in research, teaching, management and consultancy in ASAL development. Central in SASOL philosophy is commitment to participative development, which cannot be if resource conservation, within the framework of time tested technologies sustained by ASAL populations, are ignored. It was through dialogue with Kitui district communities that the need for production water was identified.

Women and children were walking to fetch household water to sources between 5 and 40 kilometers depending on the season. Animals were also being taken to the same water sources. There was no labor left for production since energy was mainly expended on water procurement chores most of the year. Animals could not keep condition walking these vast distances.

WATER PROVISION TECHNOLOGY: THE SAND DAMS

The technology selected for assuring production water is sand dam construction in cascades. Stand alone sand dam construction, some argue, is more than four thousand years old. The oldest in Kitui was constructed by a WW1 soldier Nzamba in Mathima location of Kitui district in 1928 and is still functioning. A few were constructed in the rest of Kenya during the colonial period. In the adjoining District of Machakos, the Utooni community has built about 120 since 1977.

However, construction of sand dams in cascades, to harvest production water, is SASOL's innovation. Kitui communities and SASOL have built over 600 sand dams in dry riverbeds since 1995. This is the largest application of this technology globally. This technique leads to the rivers flowing all year round, thereby dispersing watering points, even though the rainfall is less than 400mm per year. Water Aid, Simavi, MCC, DFID and SIDA have funded these efforts. Typically communities contribute 60% of dam cost through labour, provision of construction materials and water for construction as well as housing and feeding masons.

THE KITUI TARGET GROUP

The choice of district to initiate the project was made, among other things, because the district is economically and ecologically poor and the topology varied. Making water easily available would not only release women and girl children out of the drudgery of water fetching, it would also release labour for other production activities with food production being central.

It is estimated that the annual per capita cash income in Kitui District is Ksh. 2,000 i.e. US Dollar 25. This is way below the currently accepted international poverty benchmark of USD 1 per day. In the Government of Kenya, Central Bureau of Statistics, Geographic Well-being in Kenya (2003) Figure 4.1.1. Poverty Incidence District Level (p.20) shows that over 70% of the Kitui District population is below the rural poverty line. Although it is possible to quibble with the statistics on the annual per capita cash income as well as the fact that there are non-cash exchange systems operating in Kitui district, and further that there are some rich people in the district, there can be absolutely no quarrel with the fact that the bulk of the population in Kitui is very poor. They are not only cash poor but also asset poor.

The bulk of the construction crews, who are the primary beneficiaries for water is in the female gender, in all dam sites, are women. On average they

form 80% of the people working on the sand dams. It is estimated that 60% of the households are female headed. That they participate in construction should therefore not come as a surprise.

Generally the local rich have not directly participated in the construction of the sand dams. The local rich are the employed, mainly schoolteachers and some businessmen. There are mechanisms set by each dam committee, where the local rich can invest in the construction either by hiring somebody to attend on behalf of their household or wait until the dam is completed and then pay what is calculated as the total labour cost to those who are involved in construction and a punitive charge of 15% over and above this. This also applies to those employed outside the region, the main driver for such a high figure of female-headed households.

Generally then, it is the poor, in the specific communities, who build the dams. This has led to challenging of the historic community power structures, which are dominated, by teachers and business people.

ECONOMIC IMPACTS OF THE KITUI SAND DAMS

Kamale Village, Ithumula/Maluma Sub-Location

In Kamale village lives Mrs. Kavuu Kyalo, who can't hide her joy as a result of the sand dam project. "The evidence is all over", she declares. Kavuu plants vegetables (tomatoes and kale) and tree seedlings for sale. She says that she has intensified these activities by a factor of three after the sand dam project. Through selling of vegetables and seedlings, she has managed to buy livestock, build a farmhouse worth Ksh 100,000 and meet school fees expenses. "I'm relieved of looking for casual labour to look for money to pay school fees for my children. My school going children are not sent home for school fees nowadays", Kavuu states.

Even though Kavuu's husband, Mzee Kyalo, never attended the training sessions offered by SASOL, Kavuu managed to teach her husband most of what was learnt. The training sessions covered lessons on food budgeting (measuring family annual food requirements, keeping enough food for the household, cooking the right amount of food and selling what is considered a surplus at the right time), soil conservation (terracing, tree planting and making compost manure) and sanitation (building toilets and personal cleanliness).

Robert Mwanzia reveals that he is making about Ksh 10,000/= and Ksh 6,000 from vegetable and seedling sales during the three dry months. He says as a

result of the sand dams, there is prolonged moisture retention by the farms thus increased farm output.

John Kimanthi of Kaangweni village shares similar sentiments. He adds that after the community training, terracing, water boiling, tree planting and vegetables planting and literacy levels have gone up among some households.

Mr. Kithome Kavivu advised that the training was appropriate for women because the courses cantered on their roles, e.g. food budgeting. It was noted that majority of the participants were men. It is only in Kyangala and Syanduini village where the number of women either equalled or was grater that that of the male counterparts in the sub-location.

Mzee Mutua has 290 banana plants, 120 oranges trees, 100 pawpaws, 40 mango trees, 50 citrus trees and 40 avocado trees. He embarked on this prosperous project after the SASOL training. His estimated annual income from bananas alone translates to Ksh 130,000. Other fruit plants are about to start bearing fruits. Mzee Mutua laments that the greatest challenge in the future will be marketing of his produce.

We should note that SASOL does not have the capacity to organize extension. As part of the leadership and natural resources training for dam leaders, some of the production potential is discussed. It is therefore clear that the innovations in production- utilizing the sand dam water- are essentially people driven. What is clear is that once a few people are trained they are able to train others informally. This way, innovative knowledge is passed on to many more people than the ones taking part in the formal SASOL training seminars.

It should also be noted that innovations are part and parcel of extensive social and production changes the full extent of which is yet to be documented. Perhaps part of the change is tied up with new visions and the capacity of local communities to get the message that their own development is in their hands. This is a spin-off of implementing the project in a participatory way. By so doing, SASOL has empowered the communities to design their futures.

District Wide Economic Impact

What is described in Kamale is only an appetizer. Currently SASOL is looking for a creative economist to tell the district wide economic impact in ways other economists and ordinary people would understand. We state it this way for what is called for is not just the economic analysis but also the

more humane understanding of how the dams have impacted on life.

Limited data from the field shows that the dams have had fantastic socio-economic impacts. Income from horticultural trees is on the rise, though yet to be aggregated and documented. Field interview data shows that households owning land adjacent to the regenerated rivers are now earning over Ksh. 100,000 (US\$1250) in the dry three months of August, September and October from bucket irrigated vegetables planted on plots less than a quarter acre on average. One family, which has invested in a motorized pump and drip irrigation, is getting Ksh. 250,000 i.e. US\$ 3,125! The production of vegetables has not only kept traders from other districts selling vegetables in the district, particularly in Central Kitui, but has led to vegetables being available in parts of the district where there was no supply in the past.

The case of Maluma/Ithumula community is illustrative. There are 1,969 households in Maluma/Ithumula sub-location. 38.5% of the interviewed households reported that they were engaged in vegetable planting the first year after completion of the dams. The local councillor estimated that four million shillings was earned in the sub location the first year after completion of the dams.

Conservatively assuming that only 2% of the households in the district did serious planting, the first year, and further averaging down the household earned income to Ksh 90,000, with an average household having 8 people, the dry months per capita income in the district would be Ksh. 3,750. This compares to the mean per capita income from food sales of Ksh. 125 as reported by the Government of Kenya Central Bureau of Statistics 1999 Welfare Study or with the earlier reported annual per capita cash income of Ksh. 2,000. For the whole district, keeping the same assumptions, the dams could generate a hundred and eighteen million shillings (US\$1,500,000) during the dry three months whilst using the land for other production during the rest of the year and fulfilling their household food needs! We should note that there was no extension effort on this new mainly bucket vegetable production. With these incomes, the whole district can move into a higher economic plane dramatically. Further, from a health point of view, consumption of vegetables and horticultural produce has impacted positively on health, especially of women and children.

Other Benefits

It is not only agricultural production, which is afoot. Burnt brick houses have been built. Health has improved because of the synergy of better nutrition, housing and relatively clean water. But perhaps most important in the long

term is the release of labour from water fetching chores. This has improved the health of women and girls whilst making their labour available for production improvement and social life.

Improvements in incomes have led to investment in education, clearly a long-term positive effect.

To assure that the benefits continue to be enjoyed, their impact must be understood in the context of affirming collective self-help of the Kitui population and accumulation for individuals and communities. We deal with collective self help first.

SUSTAINABILITY

Poor communities need to see results immediately for they cannot afford to amortize benefits over long term. The sand dam project results are immediate. The community can see water held in the reservoir as the first rains fall following construction of a dam. Investment by the community on the development of the sand dam (on average 60% of the total cost) leads to clear ownership.

The water held in the reservoir of the dam is a community asset enabling the site community to carry out beneficial activities. The site committee oversees the well being of the asset.

Sand dams operation requires minimal maintenance. The only mandatory maintenance activity related to the sand dams is environmental management, which is not directly related to structure maintenance but is related to its proper functioning. When a sand dam is well protected and soil erosion controlled, all other operational parameters are controlled by nature, which include sedimentation and development of ground cover. However, protecting cascades from induced pollution by human waste, animal waste, soap or pesticides is still an issue.

Maturity time for a sand dam is 5-7 years. Maturity of a dam means achieving adjoining ground saturation with stored water. During this maturation period, the community is able to obtain water from it. Maturation brings along environmental changes. Enhanced agricultural use of the adjoining land leads to increase in land value. With a mature dam, water can be obtained by shallow well extraction at distances more two hundred (200) meters away from the channel. The import of this is that many households will be able to get personal wells on their plots thereby even reducing water fetching time more!

The dams provide water all year round once they have matured. This makes obtaining water convenient. When serviced with an off take well, the dams provide clean, good quality water for domestic use.

In Kitui there are isolated dams which were built in the 1950's e.g. Mukongwe built in 1957 and is still functioning and in good condition. If these were done in series, they would have impacted on a whole catchment.

Construction and user communities manage dams. The important issues in this are environmental management; pollution control and prevention of the contamination of potable water in the off take wells. These are achieved through soil conservation by terracing, planting napier grass to protect river banks erosion, instituting sanitation practices to prevent contamination with water borne diseases and prevention of putting polluting agents in the water.

All issues discussed above contribute to sustainability of the dams.

TRANSFERABILITY

Although sand dams technology is old, it has been poorly documented. Its simplicity is deceiving and many dismiss it as ineffective. The contrary is true. The simple technology, instituted in series, is highly effective in holding water and recharging the ground water. It has already changed the lives of over 200,000 people of Kitui.

When SASOL started the pilot programme with five sand dams, on the Kiindu River, in 1995, the community was sceptical. As the programme continued, the doubts have been transformed. The programme is now a fully demand driven process. There are more communities demanding site development than SASOL has been able to raise funds for. To date 400 sand dam sites have been constructed. SASOL estimates that there is active demand for another 500 dams.

After the first fifty sand dams were developed, an external audit was carried out by Prof. G B Thomas, a member of the International Water Harvesting Organization. The aim of the audit was to evaluate the effectiveness of the programme. Results of the audit were published as a booklet "Where There Is No Water" The booklet has enabled the programme to reach many people involved in water development.

A delegation of community leaders from Marsabit district, in the very arid Northern Kenya came, saw and immediately decided to send artisans from

their community to learn the techniques soon after the initial fifty dams. SASOL seconded two artisans to Marsabit to institute a sand dam programme there. To date, more than forty sand dams have been constructed in Marsabit. Requests to institute the programme in other districts in Kenya such as Machakos, Makueni, Mwingi, Baringo, West Pokot and Turkana have been received. The programme has also received delegates from Ethiopia, Tanzania, and Uganda.

This technology is transferable to all Sahelian areas.

LESSONS LEARNED

Before the construction of many dams in Kitui, the population as well as SASOL, did not understand their potential in social and physical terms fully. Now there is knowledge about the many uses and this information is discussed by all and sundry.

The community gives the site committees, formed for each dam construction site, their terms of reference, for planning and executing the project. Experience has shown that these terms of reference should be reviewed at the end of construction and a committee be reconstituted with new terms including those of operation and maintenance of the facility and the catchment.

Keeping accurate records at the site helps the community to first analyse their resources and, with respect to the sand dam, know the value of their investment. This is important for the sustainability of the facility, as the community would not like to see their investment destroyed.

The fact that the community record shows that the community contribution is equal to or higher than that from SASOL was at first shocking. However, it revealed to the community that they possess resources which when utilized properly can be used to build community and individual wealth. With proper organizational structures the community can plan and execute many more complex projects.

Involvement of all the community households is important. Defaulters must be dealt with carefully but firmly according to the laid down rules instituted at each site. Failure to deal with them will lead to conflict and threaten the investment.

Food security has improved as evidenced by the rapid growth of production of vegetables; fruits; subsistence crop yields, livestock and trees. All these

have led to savings in the households and created possibilities for increasing future community and/or individual households incomes, which in turn, can be used for further investment.

The new economic activities, which are as a result of availability of water throughout the year, have raised the need for modification of the existing social structures. This has raised the demand, in the community, for capacity building to deal with the changes.

FUTURE NEEDS

The first need is to cover those parts where there has not been construction. Already a variety of communities have petitioned SASOL to assist in building dams. It is estimated that a further 500 dams are needed in the Southern and Southwestern parts of the district. Typically in these areas women walk anywhere from 10 to 20 kilometres to fetch water. During the dry periods, when the levels are low in the limited sources, it is not unusual for women to spend a total of forty eight hours to fetch water. Building reliable water sources in these areas is an urgent need.

The second need is capacity building to enable communities to deal with issues of more complex organisation like catchment environmental protection, marketing and production innovations.

The third need is monitoring. There are two aspects of this. The first is monitoring of the impacts of sand dams on the hydrology of the area. The second one is the socio-economic monitoring of the impacts of the dams. Specific attention should be paid on the organisational aspects of the communities. SASOL